Prepared Statement of Michael A. Levi
King's College Centre for Science and Security
Department of War Studies, King's College London
and
Non-Resident Science Fellow
Foreign Policy Studies, The Brookings Institution
Before the Subcommittee on International Terrorism and Nonproliferation
House Committee on International Relations
"Averting Nuclear Terrorism"
April 14, 2005

Chairman Royce, Congressman Sherman, distinguished members of the subcommittee, it is a privilege to speak with you today on this most important subject.[1]

Defeating nuclear terrorism requires a four-layered strategy. The number of states with nuclear weapons or nuclear explosive materials must be kept to a minimum. Any remaining weapons and materials must be secured to the highest standard possible. A homeland security system must be put in place to minimize the chance that terrorists can exploit residual gaps in security over weapons and materials. And a strategy for deterring terrorist groups and potential state sponsors from involving themselves in nuclear terrorism must be developed.

The first two of these elements receive the most attention, and should shoulder most of the defensive burden. But the final two – homeland security and deterrence – have, in the context of nuclear terrorism, been unfairly maligned and inappropriately neglected. While materials security and proliferation prevention are central and critical, I urge you to understand that these alone will not eliminate the nuclear terrorist threat. After a reassessment of that threat, and a discussion of the first two strategic components, I will present an analysis that challenges much conventional wisdom on the remaining tools and highlights important new opportunities.

I will outline a set of measures that would strengthen our efforts to stop the spread of nuclear weapons and to secure existing nuclear stocks. I will outline several potential shortfalls – and I will explain how new ways of thinking about homeland security and deterrence can begin to address these gaps. This will require a careful reassessment of the terrorist threat. It will also demand creative application of technology, and innovative policy and strategy.

The Misestimated Threat

While many terrorist groups may be motivated to execute attacks with nuclear weapons, those with the capability of implementing a plot are fortunately fewer.[2] Al Qaeda is the most obvious

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[1] Much of my thinking described in this testimony has been developed through two collaborations, with Michael E. O'Hanlon of the Brookings Institution, on arms control regimes, and with Peter D. Zimmerman of King's College London, on defenses against nuclear terrorism.

[2] I will not address nuclear power plants or dirty bombs. For the former, see *Safety and Security of Commercial Spent Nuclear Fuel Storage* (Washington: NRC, 2005); for the latter, see Michael Levi and Henry Kelly, "Weapons of Mass Disruption", *Scientific American*, December 2002.

candidate with the motivation to mount an attack, and, in general, groups with apocalyptic or religious motivations are considered most likely to desire nuclear arms. In contrast, those with more limited political ends are normally assessed to be less likely to pursue nuclear terrorism.

The capability to mount an attack is harder, but far from impossible, to come by. Were a state to provide a nuclear weapon to a terrorist group, there would be little technical difficulty in delivering and detonating it. If terrorists were to steal an intact weapon from a state arsenal, they would need to circumvent its security systems, a difficult, but not impossible, task. In perhaps the most likely scenario, terrorists could steal nuclear materials and attempt to build a nuclear weapon themselves. But while success would be possible, and in a significant set of cases likely, achieving it would often be far more difficult than many have suggested. This is critical, because understanding the difficulties a terrorists face is the first step towards crafting a robust response.

Without entering sensitive territory, let me give you a flavor of what I mean:

1. To acquire the easiest-to-use nuclear materials, a terrorist group would require a sophisticated operation. Yet were a group to exploit certain more vulnerable theft targets, they would require considerably stronger technical skills to assemble a bomb.
2. In many if not most cases, advanced equipment or expertise would be needed to construct a weapon – a single Soviet scientist and simple off the shelf parts would not do.
3. The need to conceal a plot from intelligence and law enforcement would place pressures on any terrorist group, potentially forcing it to cut corners or become more sophisticated.

A group like Al Qaeda might well be able recruit the individuals needed to overcome these hurdles – but that effort itself may be vulnerable to detection. And none of this is meant to dismiss the possibility that terrorists might launch a successful attack. But it is far from certain that any particular attack would succeed. Moreover, the significant demands on a nuclear terrorist plot introduce vulnerabilities that a defense might exploit.

Mapping these details is essential. That will demand the sort of cooperation between technical and terrorism experts whose absence the Silberman-Robb Commission recently decried.

It is not useful to go beyond this basic assessment and suggest probabilities for various types of plots. We lack sufficient data to predict the future of nuclear terrorism, and I know of no well-grounded, quantitative assessment of the likelihood of an attack. All that can be said is that the probability of nuclear terrorism is not zero – and that it can be reduced. I turn to that now.

A Comprehensive Response

All nuclear plots require nuclear materials, either highly enriched uranium, or plutonium. The first and most powerful line of defense is thus to impose strict security over such materials, and over complete weapons.[3] But this conventional approach misses a third, dangerously neglected, dimension: How do we deal with situations where these tools fail? In such cases, terrorists may be able acquire nuclear materials or arms. Some have suggested that a properly implemented system of arms control and materials security can preclude such dangers. I disagree.

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[3] An discussion of these strategic elements may be found in Michael A. Levi and Michael E. O'Hanlon, *The Future of Arms Control* (Washington, DC: Brookings Institution Press, 2005).

I will discuss below how to strengthen security over nuclear weapons and materials. I will then detail some new ideas on applying homeland security and deterrence to nuclear terrorism.

Securing Nuclear Weapons and Materials

Most states share the American desire to keep nuclear weapons and materials out of the hands of terrorists. Thus the United States can often cooperate in improving security over states' stockpiles. The flagship example of this is Russia, where Cooperative Threat Reduction (CTR) has improved security for truly massive amounts of vulnerable nuclear weapons and materials.

Yet many shortfalls persist. The security of much Russian nuclear material is at best ambiguous, and at worst inadequate. Insufficient funds have been made available to remedy that gap, but more fundamentally, political barriers in both the United States and Russia have slowed progress. Russia does not want terrorists to acquire a bomb, but it does not place the same priority on the problem as the United States does. For the United States to induce the behavior it needs from Russia, it will need to be flexible. This means aggressively seeking a solution to the current conflict over liability for those implementing CTR. It may also mean providing some level of reciprocation to induce Russia to grant necessary access to its weapons complex. None of this is meant to justify Russia's inadequate commitment to securing its nuclear weapons and materials – it is simply a recommendation that in the face of Russian intransigence, we should not become stubbornly entrenched, but rather remain focused on American priorities.

Beyond Russia, Pakistan presents perhaps the most pressing problem. We should extend CTR assistance to Pakistan, learning lessons from our experience in Russia. A few differences are worth noting. While the sort of transparency demanded of Russia should be a long-term goal, Pakistani secrecy should not be made a barrier in the short term – the problem is too urgent. Moreover, in implementing solutions in Pakistan, we should focus even more on nuclear-complex insiders than we have in Russia; as evidenced by the A.Q. Khan network, ideological sympathy for radical Islamic causes runs deep in the Pakistani weapons establishment.

Despite its great promise, it is important to acknowledge that CTR will not provide complete security over the world's existing nuclear weapons and materials. Some states will not want to cooperate, and others will cooperate only incompletely. Even if the United States makes preventing nuclear terrorism its first priority, it may not have the leverage to induce complete cooperation from Russia and Pakistan, among others. And even where materials security schemes are implemented, they will often not be foolproof. So long as nuclear materials are handled regularly, rather than physically sequestered, some potential for diversion will persist.

Preventing the Spread of Nuclear Arms

Whatever the limits of CTR, one can be reasonably hopeful that those states known to possess nuclear weapons will not intentionally transfer them to terrorists. Moreover, every state known to possess nuclear weapons has decades of experience in safeguarding nuclear materials, and in most cases in safeguarding nuclear arms. New nuclear states would be different. They would lack experience in securing their weapons. Some might also be inclined to deliberately transfer

weapons or materials to terrorists. Thus an important element of any strategy for preventing nuclear terrorism is an arms control strategy that stops the proliferation of nuclear arms.

Indeed, as Michael O'Hanlon and I argue in our book *The Future of Arms Control*, preventing nuclear terrorism must be a central organizing goal in shaping future American arms control efforts. Such a system should have three key components. First, it must ensure transparency, in order to enable early detection of dangerous proliferation developments. Second, it must maintain an environment where most states will not wish to seek nuclear weapons. And third, it must effectively harness coercive means of actively stopping states from acquiring nuclear arms.

Transparency is critical whatever one's preferred policy instrument. Diplomatic intervention early in a weapons program is more likely to succeed than efforts attempted at the crisis stage. At the same time, transparent violation of nonproliferation standards is more likely to invite broad international opposition, making economic sanctions and military options more feasible and more effective. To produce added transparency, all states should be required to adopt an Additional Protocol to the NPT, and states' ability to produce enriched uranium and separated plutonium should be severely curtailed. If most countries can be induced to accept these new standards, those that refuse should to be presumed to be seeking nuclear arms.

Yet transparency will not in itself prevent proliferation. We require measures that induce states not to seek nuclear arms or to engage in other undesirable behavior. Only if we severely limit the number of problem cases this way can more coercive approaches be effective. Multilateral initiatives, whether formal or informal, help produce needed cooperation – for example, if a regime that restricts states' ability to produce nuclear materials can be designed with broad input, it is less likely to be extensively rejected. More fundamentally, the United States should extend cooperative security relationships with democratic and peaceful states that foreswear nuclear arms. By providing an alternative way to ensure states' security, these relationships would undercut motivations to seek nuclear arms. In difficult cases involving non-democratic states, carefully curtailed and conditioned security arrangements may be necessary and appropriate.

No system, though, can depend on voluntary compliance alone – possible recourse to coercive tools must be accepted and integrated into the regime. Though I will not expand on this in great detail here, I note three points. First, the United States improves its effectiveness in this area when it can work together with other powerful states, especially in applying economic sanctions. Second, such cooperation is most likely when criteria for coercive action are discussed and negotiated in advance of a crisis, rather than dictated by a single state. Third, a united front with clear criteria for intervention is more likely to deter undesirable behavior before any coercive action must be taken. None of this is to preclude unilateral action if and when it is truly necessary – it is simply to emphasize the utility of cooperative efforts in most cases.

Ultimately, though, we must accept that the full complement of cooperative and coercive tools may not succeed in preventing all proliferation. Indeed, it would not be unreasonable to judge that North Korea will retain nuclear weapons for many years in the future. Such shortfalls will result in further gaps that terrorists might exploit. There is thus a need for measures that go beyond cooperative threat reduction and beyond arms control for averting nuclear terrorism.

Defense in Depth: The Neglected Dimensions

Securing nuclear materials, and preventing the spread of nuclear arms, are the most critical components of a strategy for averting nuclear terrorism. But they are marked by persistent shortcomings. I now want to suggest some ideas for how these residual gaps might be addressed.

Homeland Security

If terrorists acquire nuclear material through theft or through insider assistance, they must still build a nuclear weapon and transport it to its target to complete a successful attack. Most analysts have insisted that this is a trivial undertaking, at least when compared with the difficulty of acquiring nuclear material in the first place; as a result, they have concluded that most measures aimed at stopping terrorists at this stage are futile. These are flawed judgments.

Building and transporting a bomb can be considerably more difficult than most assume, and there are many opportunities for plot-ending errors and for discovery by intelligence or law enforcement.[4] International intelligence cooperation can be critical in putting together signs of a plot that might be distributed through several countries. International cooperation to control sensitive non-nuclear materials and equipment can also put pressure on terrorist plots.

Equally important, terrorists, like all others, make mistakes. In preventing crimes, police frequently exploit criminals' foolish errors – indeed, they prepare for just such occurrences. Most thinking about defense against nuclear terrorism, however, has focused on scenarios involving "perfect" terrorist plots. A smart strategy would attempt to induce and anticipate terrorist errors, and would be prepared to capitalize on them.

A defense need not be perfect, or even near-perfect, to appreciably reduce the probability of a successful nuclear terrorist attack. The popular belief that terrorist groups like al Qaeda cannot be deterred is only half true. Observers are right to estimate that a group like al Qaeda would be willing to endure severe retribution following a successful nuclear attack, undermining a basic tenet of deterrence. But such a group would not be willing to endure severe retribution following a *failed* nuclear plot. Thus increasing the likelihood that a plot will fail, while promising retribution even for *failed* nuclear plots, may be useful in deterring attacks themselves.

Deterring State Transfers of Nuclear Arms

The promise of deterrence does not end there. Were a state to transfer a nuclear weapon to a terrorist group, the opportunities for interdiction would be considerably fewer than were terrorists to steal nuclear materials and attempt to build a bomb themselves. It may be possible, though, to deter states themselves from transferring nuclear arms to terrorists.[5] Many have argued that states could transfer weapons to terrorists without fear of detection, and could thus escape possible retaliation, gutting the core of deterrence. Yet such anonymity is far from

[4] I would be pleased to expand on these observations in more detail in private.
[5] Michael Levi, "Deterring Nuclear Terrorism", *Issues in Science and Technology*, Spring 2004.

guaranteed. Moreover, appropriate investment in technology can make detection more likely, while proper policy can leverage that technology to strengthen deterrence.

To deter states from passing nuclear weapons or materials to terrorists, we must have the capability to attribute nuclear weapons to their states of origin. The United States already has significant capabilities in this area as a legacy of its Cold War intelligence activities. The United States inferred details of Soviet nuclear weapons by analyzing debris produced by Soviet nuclear tests, and similar techniques could be adapted to determine the origin of a nuclear weapon following a nuclear terrorist attack, and hence to target a retaliatory response. (This may seem like little consolation, but the purpose would of course be to deter such attacks in the first place.) Several advances are necessary, however. First, the human capital involved in analyzing weapon debris has atrophied since the Limited Test Ban Treaty removed testing debris from the atmosphere; an effort to bolster such capabilities is necessary, and would not require nuclear testing. Second, an understanding of weapons that might figure in terrorist scenarios, rather than in Soviet designs, must be developed. Third, and most challengingly, a set of "fingerprints" for nuclear weapons and materials in various states must be developed in order to match terrorist weapons to state stockpiles. Some of this may be possible through traditional intelligence. Most likely, however, an international organization with privileged access to states' nuclear complexes – possibly the IAEA – will have to play a role. It should be in the interest of most states to divulge basic information, if only to rule themselves out as originators of terrorist nuclear arms.

Strategy is as important as technology. The United States needs to determine what consequences would follow terrorist attacks, and to communicate these to would-be state sponsors. In some cases, the response would be clear – North Korea, for example, would meet massive retaliation were it to provide a nuclear weapon to a terrorist group. But other cases would be harder. Were a Russian nuclear weapon acquired by terrorists, the United States would be unlikely to strike back. I would suggest that no one knows what steps the United States would take were terrorists to acquire a Pakistani bomb. Would the United States attack its ally? Would it matter whether the bomb was stolen, or provided deliberately? The United States needs to answers these questions *now*, and make its retaliatory policy clear. Clarity would go a long way towards deterring transfers of nuclear weapons, ensuring actual retaliation would never be necessary.

Conclusions

There is no magic bullet for preventing nuclear terrorism. Our most powerful tools are cooperative threat reduction, which we can use to secure existing weapons and materials, and nonproliferation, which we can use to prevent new states from acquiring nuclear arms. These should receive the bulk of our focus. But they are fallible. They should not be the entire extent of our strategy, which must create defense in depth. An effort that harnesses intelligence, law enforcement, and border security, working together to promote and capitalize on terrorist error, would provide an extra layer of security against nuclear attack. And a carefully crafted deterrent posture can reduce the risk that states will transfer nuclear weapons to terrorist groups. Maximizing the effectiveness of each of these four elements demands technical and policy innovation, and will require international cooperation. All are worthy objectives.

Thank you.